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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/621,795	07/21/2000	Daniel N. Miller	LOCK1260-1	4580

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EXAMINER
KIM, TAE JUN

ART UNIT	PAPER NUMBER
3746	

DATE MAILED: 05/31/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/621,795	Applicant(s) MILLER ET AL.	
	Examiner Ted Kim	Art Unit 3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 April 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *31-74* is/are pending in the application.

4a) Of the above claim(s) *70-74* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *31-69* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 April 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The formal sheets of drawings, filed on 4/8/02 have been received but not approved because applicant has not submitted a proposed drawing correction in the form of a pen-and-ink sketch showing changes in red ink or with the changes otherwise highlighted. See MPEP § 608.02(v).

2. The drawings are objected to because applicant should show wherever possible the flow arrows for the injected fluid, e.g. in Fig. 2B, 3A-E.

3. The drawings are objected to because in Figure 5A-5C, the arrows for the yaw vectors and pitch vectors are not shown properly. For example, if Fig. 5B is a top down view, then the pitch vector should not be shown in the horizontal plane but should be directed into the page, e.g. compare with Fig. 5A. Applicant is required to correct the positioning of the vectors.

4. The drawings are objected to because in figure 11, the angle for 286 of 15 degrees, is supposed to be relative to the longitudinal axis of the engine not the inner surface of the nozzle (see page 40, circa line 7). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the secondary flow

being fuel (e.g. claim 41) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Election/Restrictions

6. Newly submitted claims 70-74 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: they are directed to a method of designing a nozzle, with steps comprising analyzing a baseline configuration, establishing a design study matrix..., etc. These method design steps are distinct from the rest of the claims, which claim an actual nozzle or an actual method of vectoring a nozzle.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 70-74 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Objections

7. Claims 50 and 69 are objected to because of the following informalities: they do not form a complete sentence and do not have a period at the end of the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claims 31-69 are rejected under 35 U.S.C. 112, first paragraph, because the specification, does not reasonably provide enablement for "the injectors are *not aligned parallel* to the path of the primary flow of fluid" and also "... the injection direction ... approximately parallel to an intended vector plane." See claims 51, 53, 56, 63-65. Due to the use of negative limitations, "not aligned parallel" has to apply to everywhere within the flow for the primary flow, including downstream of the injectors where the thrust vectoring occurs. Clearly, the claim limitations indicated above are contradictory, in the flow area where the thrust vectoring occurs.

Another substantive issue of non-enablement is with regard to the injectors, clearly, **each of** the injectors is *no*t adapted to expel the fluid in a direction that is "approximately parallel to an intended vector plane." The top injectors and the bottom injectors are not both parallel to the same intended vector plane, only one of which can be parallel at any given time. A similar problem occurs with the second plurality of injectors, **each of** the second plurality of injectors is *no*t adapted to expel the fluid in a direction that is "approximately parallel to an intended vector plane." Note that in fig. 12, only the top injector 307 is approximately parallel to the vector plane shown by the angle 306. The bottom injector 308 is clearly not even remotely substantially parallel to the vector plane.

The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

10. Claim 38, 57 is rejected under 35 U.S.C. 112, first paragraph, because the specification, does not reasonably provide enablement for providing a symmetric flow to vector the primary flow (compare with claims 31, 51).

11. Claims 31-69 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements and method steps, such omission amounting to a gap between the elements. See MPEP § 2172.01. The only support the examiner can find for "... the injection direction ... approximately parallel to an intended vector plane" is with the description and illustration of fig. 12. However, in order to accomplish the result, there are numerous omitted elements including: there are no primary and secondary injectors, with primary injectors being upstream of the secondary injectors and forming the sonic plane. There is also no way to form an intended vectoring plane, i.e. selective operation of the needed injectors, in the independent claims.

*** Claim interpretation -- due to the numerous deficiencies under 35 USC 112, those claim limitations which are indefinite and non-enabled have been given little patentable weight in the rejection below.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 51-54, 56, 57, 69-65, 63-69, as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over McCullough (3,698,642) in view of either Ernst (3,294,323) or the AIAA paper of Miller et al. (AIAA 95-2603) of the IDS. McCullough teaches a nozzle having a primary flow, a primary injector 16, and a secondary injector 18, and valve controllers 22 to direct a flow to vary the effective throat area of the nozzle and perform thrust vectoring (top of col. 2). McCullough further teaches the use of fuel (col. 2, lines 26-28). Alternately, for the controllers, it is clear that the valves require a controller to actuate them. It would have been obvious to one of ordinary skill in the art to employ a software based controller in addition to the valves, in order to provide the necessary control over the thrust vectoring and/or throat control. McCullough do not teach the primary and secondary injectors are inclined to oppose the flow. Ernst teaches that it is old and well known in the thrust vectoring art to employ primary and secondary injectors 1, 3 that are either angled perpendicular to the primary flow (Fig. 1) or inclined to oppose the flow (Fig. 3) and shows that the effective vector O can be increased by using opposed flow (compared Fig. 3 to Fig. 1). Miller et al. teach a fixed geometry exhaust nozzle used for gas turbine/turbofan engines (which inherently employ compressors) where the nozzle area is varied by a cross flow injected in the upstream direction (Figs. 2-5) in order to achieve a variable throat area. At the throat, the primary

flow reaches the sonic condition. Miller shows on the cover sheet of the paper that the flows from the primary and secondary injectors can be angled to oppose the flow. Miller et al further teach very low injection angles are possible (see top left of fig. 9) and hence, as the angles are very low, the angles will also be approximately parallel the vector angle, which would also be low. It would have been obvious to one of ordinary skill in the art to incline the injectors of McCullough to oppose the flow, as taught by either Ernst or Miller et al, in order to enhance the effectiveness of the thrust vectoring and/or to employ an alternative means of vectoring well established in the art. As for using the nozzle with a jet engine aboard an aircraft, this is taught by the Miller paper. It would have been obvious to one of ordinary skill in the art to employ the nozzle with a jet aircraft, as a well known application of such a nozzle.

14. Claims 51-69, as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over McCullough (3,698,642) in view of either Ernst (3,294,323) or the AIAA paper of Miller et al. (AIAA 95-2603) of the IDS, as applied above, and further in view of either Kranz et al. (4,351,479) or Warren (3,204,405). McCullough teaches various aspects of applicant's claimed invention but does not teach the flow is pulsed. Kranz et al. teach a jet engine nozzle 7 having a plurality of injectors (a-f) spaced about the housing, and valve controllers 36 associated with the injectors, the controller directing the injectors to provide an unsteady, i.e. pulsed, fluidic cross flow. The pulsed cross flow is injected to control the effective flow area, throttle and also vector the primary fluidic flow (see especially col. 5, lines 9 and following). The pulsed cross flow partially blocks

the opening of the nozzle and can be either symmetric (area control) or asymmetric (thrust vectoring) as desired. Please note that as the effective flow area for the primary fluid flow is controlled, the temperature and pressure of the primary gas is inherently controlled by variation of the primary fluid flow velocity. The pulsed cross flow controller inherently controls the frequency, amplitude and wave form of the pulses. Kranz et al. teach that by employ pulsed flow, more effective deflection of the incoming flow is achieved (col. 1, lines 7 and following). Warren et al teach a thrust vectoring system for a reaction engine where pulsed flow (col. 9, lines 2 and following, especially circa line 63) is injected at the throat (e.g. Fig. 6a, 11, 121) to provide vectoring of the primary fluid. Warren also teach that the pulsed fluid can be fuel. It would have been obvious to one of ordinary skill in the art to employ pulsed flow of the cross flow injected by McCullough, as taught by either Kranz et al. or Warren et al, to more effective control the cross flow penetration of McCullough, and to enhance the thrust vectoring ability.

15. Claims 51-54, 56, 57, 69-65, 63-69, as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over the AIAA paper of Miller et al. (AIAA 95-2603) of the IDS in view of McCullough (3,698,642). Miller et al. teach a fixed geometry exhaust nozzle used for gas turbine/turbofan engines (which inherently employ compressors) where the nozzle area is varied by a cross flow injected in the upstream direction (Figs. 2-5) in order to achieve a variable throat area. At the throat, the primary flow reaches the sonic condition. Miller et al show on the cover sheet of the paper that the flows from the primary and secondary injectors can be angled to oppose the flow.

Miller et al. do not teach thrust vectoring. However, it is clear that in a fixed nozzle, thrust vectoring capacities are generally required in order to steer the nozzle, especially in a military aircraft. Miller et al further teach very low injection angles are possible (see top left of fig. 9) and hence, as the angles are very low, the angles will also be approximately parallel the vector angle, which would also be low. McCullough teaches a nozzle having a primary flow, a primary injector 16, and a secondary injector 18, and valve controllers 22 to direct a flow to vary the effective throat area of the nozzle and perform thrust vectoring (top of col. 2). McCullough further teaches the use of fuel (col. 2, lines 26-28). Alternately, for the controllers, it is clear that the valves require a controller to actuate them. It would have been obvious to one of ordinary skill in the art to employ a software based controller in addition to the valves, in order to provide the necessary control over the thrust vectoring and/or throat control. It would have been obvious to one of ordinary skill in the art to both control the throat area and thrust vector the nozzle of Miller et al, as taught by McCullough, in order to add vectoring capabilities to the nozzle of Miller et al.

16. Claims 51-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over the AIAA paper of Miller et al. (AIAA 95-2603) of the IDS in view of McCullough (3,698,642), as applied above and further in view of either Kranz et al. (4,351,479) or Warren (3,204,405). Miller et al teach various aspects of applicant's claimed invention but does not teach pulsing the flows nor the flows being fuel. Kranz et al. teach a jet engine nozzle 7 having a plurality of injectors (a-f) spaced about the housing, and valve

controllers 36 associated with the injectors, the controller directing the injectors to provide an unsteady, i.e. pulsed, fluidic cross flow. The pulsed cross flow is injected to control the effective flow area, throttle and also vector the primary fluidic flow (see especially col. 5, lines 9 and following). The pulsed cross flow partially blocks the opening of the nozzle and can be either symmetric (area control) or asymmetric (thrust vectoring) as desired. Please note that as the effective flow area for the primary fluid flow is controlled, the temperature and pressure of the primary gas is inherently controlled by variation of the primary fluid flow velocity. The pulsed cross flow controller inherently controls the frequency, amplitude and wave form of the pulses. Kranz et al. teach that by employ pulsed flow, more effective deflection of the incoming flow is achieved (col. 1, lines 7 and following). Warren et al teach a thrust vectoring system for a reaction engine where pulsed flow (col. 9, lines 2 and following, especially circa line 63) is injected at the throat (e.g. Fig. 6a, 11, 121) to provide vectoring of the primary fluid. Warren also teach that the pulsed fluid can be fuel. It would have been obvious to one of ordinary skill in the art to employ pulsed flow of the cross flow injected by Miller et al, as taught by either Kranz et al. or Warren et al, to more effective control the cross flow penetration, and to enhance the thrust vectoring ability.

17. Claims 31-35, 37-39, 40-42, 44-46, 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over **either** McCullough (3,698,642) in view of either Ernst (3,294,323) or the AIAA paper of Miller et al. (AIAA 95-2603) **or** AIAA paper of Miller et al. (AIAA 95-2603) of the IDS in view of McCullough (3,698,642), as applied above,

and further in view of either Terrier (5,665,415) or Justice (6,00,635). The above prior art teach various aspects of applicant's claimed invention but do not specifically teach a 3D fixed nozzle. Terrier teaches (fig. 8) that ultra high aspect ratio biconvex aperture nozzles are old and well known in the fixed nozzle art. Justice teaches that it is old and well known in the fixed nozzle art employ an ultra high aspect ratio trapezoid aperture nozzle 33B (col. 2, circa line 63). It would have been obvious to one of ordinary skill in the art employ a 3D nozzle, including either an ultra high aspect ratio biconvex or trapezoid aperture nozzle, as well known types of fixed nozzles utilized in the art.

18. Claims 31-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over **either** McCullough (3,698,642) in view of either Ernst (3,294,323) or the AIAA paper of Miller et al. (AIAA 95-2603) and further in view of either Kranz et al. (4,351,479) **or** Warren (3,204,405) **or** AIAA paper of Miller et al. (AIAA 95-2603) of the IDS in view of McCullough (3,698,642) and either Kranz et al. (4,351,479) or Warren (3,204,405), as applied above,, and further in view of either Terrier (5,665,415) or Justice (6,00,635). The above prior art teach various aspects of applicant's claimed invention but do not specifically teach a 3D fixed nozzle. Terrier teaches (fig. 8) that ultra high aspect ratio biconvex aperture nozzles are old and well known in the fixed nozzle art. Justice teaches that it is old and well known in the fixed nozzle art employ an ultra high aspect ratio trapezoid aperture nozzle 33B (col. 2, circa line 63). It would have been obvious to one of ordinary skill in the art employ a 3D nozzle, including either an ultra high aspect ratio

biconvex or trapezoid aperture nozzle, as well known types of fixed nozzles utilized in the art.

19. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

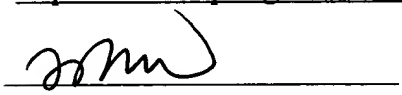
Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Ted Kim whose telephone number is 703-308-2631. The Examiner can be reached on regular business hours before 5:00 pm, Monday to Thursday and every other Friday.

The fax numbers for the organization where this application is assigned are 703-872-9302 for Regular faxes and 703-872-9303 for After Final faxes.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Thorpe, can be reached on 703-308-0102.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist of Technology Center 3700, whose telephone number is 703-308-0861.

General inquiries can also be directed to Technology Center Customer Service Office at 703-306-5648 or the Patents Assistance Center whose telephone number is 800-786-9199. Furthermore, a variety of online resources are available at http://www.uspto.gov/main/patents.htm



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